



IMPACT OF CLIMATE CHANGE ON AGRARIAN PRODUCTIVITY IN RELATION WITH SOCIO-ECONOMIC SUSTAINABILITY IN INDIA

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ABSTRACT

The research paper focuses upon the up-surging issues and problems that deals with the climate change on the agrarian production in India. In the present Indian economic scenario, the problems of climate change is complex and has phenomenal impact upon the human health, agricultural sector and its productive-ratio. Climate change and agricultural sector are mutually correlated as both issues are of global concern. Climate change is defined as "An average long term weather condition of a certain place, including temperature, rainfall and wind. Here, climate change refers to the change of climate attributed directly or indirectly to human activity which alters the composition of the global atmosphere and in addition to natural variability observed over comparable time-periods". (United Nations Framework Convention on Climate Change, UNFCCC) 2011. Although, climate change plays a crucial role in the development of Indian economy as it largely affects not only India's Agriculture, Forestry, Agrarian production, Human capital and Land quality but also directly affects Imports and Exports, Foreign trade and Exchange, Environmental degradation and a wider portion of world population. Therefore, India's agriculture productivity got highly affected by the climate change not only quality-wise but also quantity-wise i.e. in terms of production of crops & their nutritional-value. India is a land blessed by several types of climates, out of which one of the main determining season tends to be the 'Monsoon'. On an average, it provides 80% of the annual rainfall between 750-1500 mm across the country region. It is regarded to be the most productive season for the agrarian sector. This paper attempts to probe out the suggestions and measures to reduce the impact of climate change on the sustainability of agricultural sector, protecting the human health and socio-economic development of people in India.

KEYWORDS: Agrarian productivity, Climate change, Socio-economic sustainability.

INTRODUCTION

India is considered as one of the fastest growing major economy and the second largest populated country in the world numerically signifying over 1.2 billion. A major research study carried out by *International Crop Research Institute for the Semi-arid Area Tropics (ICRISAT) 2013* aims to find out the scientific and advanced technology which enables to improve Asia's agricultural system to cope up with the climate change while benefiting the poor and vulnerable farmers and the landlords. As climate change poses a deep impact upon their household income and socio-economic status, so its adverse repercussions can also be observed. (Mishra Diptimayee & Sahu Naresh Chandra, 2014). On an average, about 67% of the India's total population reported to be engaged in agriculture sector out of which mostly marginal and small farmers dominates the agricultural activity. About 60% of cultivated land area is rain fed whereas only 40% of land area is under irrigation. In this, major seasonal crops such as- rice, wheat, maize, coarse- cereals, groundnut, cotton, sugarcane, fruits and vegetables bear the consequences of the adversity of the scanty or delayed rainfall frequently every year. In an address to the Security Council during a debate on Climate change, *UN General-Secretary Ban Ki Moon* states that climate change is a threat to the world peace and security. Therefore, the organization is focusing upon the techniques of emission-free power which may prove worthy for the sustainable conservation of environment.

FACTORS INFLUENCING CLIMATE CHANGE

Climate is a vibrant phenomenon and it undergoes continuous changes over a period of time. There are several factors responsible for the climate change mainly natural factors and anthropogenic factors (man-made). The natural factors are described as - change in solar radiation, greenhouse gases, deforestation, change in land use pattern, energy uses, vehicular usage etc., whereas the anthropogenic factors determine all those human activities which may affect the climate change as follows :

- **Emission of Greenhouse gases-** The enormous emissions of greenhouse gases in the environment as a result of industrialization & urbanization phenomena in the course of growing human civilization is considered to be the main causal factors accelerating climate change in the post industrialization in India. The composition of these gases includes: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydro-fluorocarbons (HFC), sulphur hexafluoride (SF₆), per fluoro carbons (PFC). The sector which accounts for the tremendous and hazardous emission of these GHGs is the Energy sector (25.9%) on the top followed by the Industrial sector (19.4%).
- **Deforestation-** Forest degradation is one of the major cause of carbon sequestration and exploitation of the bio-diversity which acts as the main artery of any environment and ecosystem.
- **Energy usage -** After globalization, India stands on a high growth path and envisage about 7-8% GDP growth rate per annum. Fuel, coal, wood and diesel are the major sources of power production in India due to which extreme

heat and degree of temperature occurs at a vast rate.

- **Vehicular usage -** The use of vehicles increased at a fast rate giving rise to air and noise pollution that causes environmental-degradation which ultimately leads to the climate change. Moreover, there are various other anthropogenic factors (man-made) which are responsible for the climate change system in India such as- Burning of fossil fuels, degradation of land, conversion of land, increases the level of water and air pollution, deforestation, setting up of new industries, more use of nuclear power, industrialization, carbon monoxide, urbanization, more use of chemical-fertilizers for better agricultural productivity in India etc. As per the *World Resource Institute (WRI) Report 2012*, the prominent factors causing climate change are shown in the table below:

VARIOUS PROMINENT FACTORS	PERCENTAGE
Electricity/Heat	30.6%
Transportation	14.8%
Manufacturing/construction	13.3%
Agriculture	11.1%
Fuel combustion	8.2%
Deforestation	5.7%
Fugitive Emissions	5.3%
Wastage	3.1%
Bunker Fuels	2.2%

(Source: World Resource Institute Report, 2012)

According to the *World Economic Forum (WEF) ND-GAIN Index (2013)*, the table summarizes the list of top ten countries at "extreme risk" due to rapid climate change reported as per the *Climate Change Vulnerability Index (CCVI), 2011* and their readiness to counter the resilience. India stands at the second position in the world vulnerability index. It shows that, in India climate changes more rapidly than any other country and poses severe impacts in many ways.

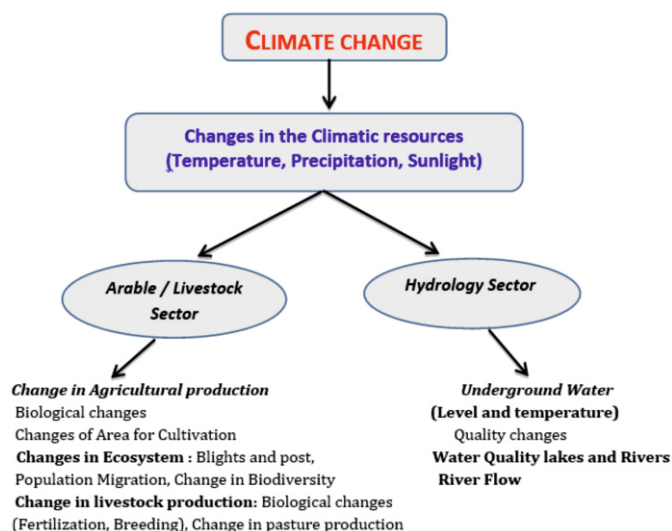
RANK	COUNTRIES
1	BANGLADESH
2	INDIA
3	MADAGASCAR
4	NEPAL
5	MOZAMBIQUE
6	PHILIPPINES
7	HAITI
8	AFGHANISTAN
9	ZIMBABWE
10	MYANMAR

(Source: Climate Change Vulnerability Index 2011)

EFFECTS OF CLIMATE CHANGE ON AGRICULTURE SECTOR IN INDIA

India economy is agrarian in nature. As, climate change and agriculture both are interrelated processes, they are of global concern on the basis of their impacts & consequences. **Dr. Chang-Gil Kim (Korea Rural Economic Institute), 2010** describes "The flow of the impact of climate change on the agriculture sector can be illustrated as below wherein, impact of climate change on the arable and livestock sector are made known by biological changes including the change of flowering and harvesting seasons, quality change and shifts of areas suitable for cultivation and irrigation in India's agrarian productivity".

HOW CLIMATE-CHANGE AFFECTS AGRARIAN STRUCTURE IN INDIA



(Source: Asia and the Pacific Research Report, 2010)

India's climate is dominated by the monsoon season and it is considered as one of the most crucial season of India because it provides about 80% of the annual rainfall. Monsoon is defined as the tropical and subtropical seasonal reversal in surface wind and associated precipitation, caused by heating between continents precipitation and also caused by heating between continental-scale land mass and the adjacent ocean- **Intergovernmental Panel on Climate Change (IPCC), 2011**. Climate change and agriculture both plays a very significant role in the global environment. The agriculture sector requires heavy reliance on irrigation, use of fertilizers and crop residual burning etc. all of which impose a direct impact on the climate change via greenhouse gases. **According to World Bank (2001)**, the main causal factors of climate change are- extreme heat, drought, changing rainfall patterns, groundwater table, melting of glaciers, sea-level rise, agriculture & food security, energy security, migration, conflicts etc. All these aforementioned phenomena are the causes as well as the factors affecting the climate change which in turn greatly affects the agriculture and its productivity.

IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH

According to World Health Organization (WHO) Report, 2012 climate change and high vulnerability affects the human health both mentally and physically which leads to deteriorating impacts in the society as well. The intermittent and rapid climate change causes plants and animals to relocate, exposing human population and crop plants, livestock, wildlife and the harmful diseases. It affects the birth and mortality rate of human population. In spite of the above mentioned factors, the major serious threats to human health are as follows -

- **Extreme heat:** Due to the extreme heat rise, a number of heat-related illness develops such as cardio-vascular failure and even death occurs.
- **Environmental degradation:** It directly leads to cause migration from one place to another temporary and permanently and increases the conflict & stress.
- **Water, air and food quality degrades:** The quality degradation of water, air and food leads to many bacterial and viral diseases such as cholera, breathing problems and asthma etc. which directly affects the human health.
- **Increase in the CO₂ levels:** Due to the increasing percentage of carbon dioxide in the atmosphere, may lead to vast ecological changes such as harmful diseases such as: Malaria, Rift of valley fever, West Nile virus, allergies and breathing problems like asthma etc.

All these above mentioned factors pose serious threat to the human's mental, social and physical health.

SUGGESTIVE MEASURES NEED TO BE TAKEN

The visible dimensional impacts of climate change can be observed in the following forms as floods, earthquakes, volcanoes, cyclones, typhoons, solar radiations, rising sea level, increasing temperature, rising migration and conflicts, untimely rainfall, melting mountain glaciers, coastal erosion, loss of biodiversity, decreases the level of groundwater table etc. which directly affects the geographic and social life of human-beings. Therefore, to counter the diverse and varied impacts of climate change upon environment, agriculture, human health, economy and social life we should promote and encourage the sustainable and judicious use of non-renewable resources along with the efficient and ethical conservation of natural resources to be present in the near future too.

CONCLUSION:

There is a dire need to adopt environmental befitting plans or policies to be recognized at local, state, national and international levels to protect agriculture sector from the impact of climate change. And provides incentives and efficient facilities to the farmers for resource conservation by providing credit to the farmers for transition to adopt advanced technology, use of new techniques such as drip and sprinklers irrigation for crops etc.

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